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Patent
ATTY. DKT. AMAT/1931/CALB/COPPER/SB

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of:	Fusen Chen, et al.	§	
		§	Group Art Unit: 2814
Serial No.:	08/856,116	§	
		§	Examiner: Bernard Souw
Filed:	May 14, 1997	§	
		§	
For:	Reliability Barrier Integration For CU Application	§	

CERTIFICATE OF MAILING
37 C.F.R. 1.8
I hereby certify that this correspondence is being deposited on February 1, 2001, with the U. S. Postal Service as First Class Mail in an envelope addressed to: Assistant Commissioner of Patents, Washington, D.C. 20231.

2/1/01 — B. Todd Patterson
Date — B. Todd Patterson

Assistant Commissioner of Patents
Washington, D.C. 20231

Dear Sir:

APPEAL BRIEF

Applicants submit this Appeal Brief to the Board of Patent Appeals and Interferences on appeal from the decision of the Examiner of Group Art Unit 2814 dated June 29, 2000, finally rejecting claims 1-8, 11-18, and 20-24. Please charge the fee of $300.00 for filing this brief, and any additional fees to make this submission timely, to Deposit Account No. 20-0782/APPM/1931/BTP. A duplicate copy of this letter is enclosed. Three copies of this brief are submitted for use by the Board.

Real Party in Interest

The present application has been assigned to Applied Materials, Inc., 3050 Bowers Avenue, Santa Clara, California 95054.

Related Appeals and Interferences

Appellant asserts that no other appeals or interferences are known to the appellant, the appellant's legal representative, or assignee which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

Status of Claims

Claims 15-18, 21, and 23 are pending in the application. Claims 1-20 were originally presented in the application. Claims 21-24 were added during prosecution, and claims 1-14, 19-20, 22, and 24 were canceled without prejudice by the Applicants during prosecution. Claim 19 was restricted and canceled without prejudice by Applicants during prosecution. Claims 15-18, 21, and 23 stand rejected in view of a combination of references as discussed below. The rejection of claims 15-18, 21, and 23 is appealed. The pending claims are shown in the attached Appendix. No claims have been allowed.

Status of Amendments

The claims in the Appendix include all amendments entered by the Examiner prior to filling of this Appeal Brief.

Summary of the Invention

The claimed invention generally provides a method for filling a feature with copper. In one embodiment, the method comprises first forming a reliable barrier layer in the feature to prevent diffusion of the copper into the dielectric layer through which the feature is formed. The method for filling a feature formed in a dielectric comprises forming a generally conformal first barrier layer 16 over a patterned dielectric 12, removing the portion of the first barrier layer 16 formed on the bottom 22 of the feature 20, depositing a second barrier 24 comprising a material selected from a group consisting of Ta, TaN, TaSiN, TiSiN, and combinations thereof, and then filling the feature 20 with copper. (*See* page 6, lines 5-22; *see also* Example 1, page 12, line 22, to page 13, line 7, and Figures 2-6) In another embodiment, the method comprises depositing a first

barrier layer 16 over a blanket dielectric layer 12, forming a feature 20 through both the barrier layer 16 and the dielectric layer 12, depositing a second barrier layer 30 in the feature 20, removing the barrier layer 30 from the bottom of the feature 20, and selectively depositing a metal layer in the feature 20. (*See* page 6, line 23, to page 7, line 11; *see also* Example 2, page 13, lines 8-16, and Figures 7-12).

Issues Presented

1. Whether the Examiner erred in rejecting claims 15-18 and 23 under 35 U.S.C. § 103(a) as being unpatentable over *Taguchi et al.* in view of *Tseng et al.*

2. Whether the Examiner erred in rejecting claim 21 under 35 U.S.C. § 103(a) as being unpatentable over *Taguchi et al.* in view of *Tseng et al.*, and further in view of *Ho et al.*

Grouping of Claims

Pending claims 15-18, 21, and 23 do not stand or fall together for all arguments presented by Applicant. Applicant's first argument relates to claims 15-18 and 23, and claim 1 is representative of the claims. Applicant's second argument relates to claim 21, which stands on its own.

ARGUMENT

I. THE EXAMINER ERRED IN REJECTING CLAIMS 15-18 AND 23 UNDER 35 U.S.C. § 103(a) BECAUSE THE CITED REFERENCES DO NOT TEACH, SHOW, OR SUGGEST DEPOSITING A BARRIER LAYER THAT IS REMOVED TO EXPOSE AN UNDERLAYER WITHIN A FEATURE, AND SELECTIVELY DEPOSITING A METAL LAYER ON THE UNDERLAYER TO FILL THE FEATURE.

Claims 15-18 and 23 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Taguchi et al.* in view of *Tseng et al.*, on grounds that the combination of references shows each feature of the claimed invention. Applicants respectfully traverse this rejection on grounds that the claims include the novel combination of depositing a barrier layer that is removed to expose an

underlayer within a feature, and selectively depositing a metal layer on the underlayer to fill the feature as described in the specification and Figures 7-11.

To determine patentability under 35 U.S.C. § 103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved, and the obviousness or non-obviousness of the subject matter is determined against this background. *Graham v. John Deere*, 383 U.S. 1 (1966). Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). To establish prima facie obviousness of a claimed invention, all the claimed limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974).

Taguchi et al. discloses deposition of a first barrier layer on the sidewalls of a hole in order to reduce oxidation of a second barrier layer of titanium and provide an improved wetting surface for aluminum fill of a hole. *Taguchi et al.* further discloses conformal deposition of the second barrier layer on the bottom and sidewalls of the feature and requires the formation of two barrier layers on the sidewalls of a hole before filling the feature with metal. The conformal barrier layer of *Taguchi et al.* is not removed to expose an underlayer, but rather retained in a conformal state to ensure conformal fill of the feature by aluminum.

Taguchi et al. does not teach, show, or suggest forming a feature through a first barrier layer formed on a dielectric layer and through the dielectric layer. *Taguchi et al.* does not teach, show, or suggest depositing a second barrier layer on the bottom and sidewalls of the feature and removing the second barrier layer formed at the bottom of the feature prior to depositing a metal layer.

Tseng et al. discloses the formation of a polysilicon plug by depositing a first barrier layer over a blanket dielectric layer, forming a feature through a barrier layer and the dielectric layer to

expose an underlayer, depositing a polysilicon fill layer in the feature, and removing the barrier layer from the surface of the blanket dielectric layer prior to deposition of a metal layer.

Tseng et al. does not teach, show, or suggest depositing a second barrier layer on the bottom and sidewalls of the feature. *Tseng et al.* does not teach, show, or suggest removing the second barrier layer formed at the bottom of the feature prior to depositing a metal layer. Further, *Tseng et al.* does not teach, show, or suggest selectively depositing a metal layer on the underlayer exposed in the feature. Therefore, neither *Taguchi et al.* or *Tseng et al.*, alone or in combination, teach, show, or suggest depositing a barrier layer that is removed to expose an underlayer within a feature, and selectively depositing a metal layer on the underlayer to fill the feature.

Applicants further submit that the Examiner has erroneously combined the elements of *Taguchi et al.* and *Tseng et al.* without a proper motivation or suggestion to combine the references. The Examiner has identified some elements of the claims in abstract by the use of individual references to teach individual elements, and has not identified a suggestion or motivation for combining the elements to teach the invention. A rejection cannot be predicated on mere identification of individual components of the claimed invention; but rather particular findings must be made as to the reason the skilled artisan, with no knowledge of the claimed invention, would have selected these components for combination in the matter claimed. *See, In re Kotzab,* 55 USPQ2d 1313, 1317 (Fed. Cir. 2000).

Taguchi et al. discloses a process to improve an aluminum metallization process, and *Tseng et al.* teaches an improved technique to form polysilicon contact plugs for active silicon device elements. The metal free polysilicon plug formation process of *Tseng et al.* does not address the same or similar problems in the art as disclosed in the aluminum metallization process of *Taguchi et al.* and, therefore, it would not have been obvious to modify *Tseng et al.* by *Taguchi et al.* to produce the claimed invention. Accordingly, there is no suggestion or motivation in *Taguchi et al.* or *Tseng et al.*, either alone or in combination, to form a feature through a first barrier layer formed on a dielectric layer and through the dielectric layer, deposit a second barrier layer on the bottom and sidewalls of the feature, and remove the second barrier layer formed at the bottom of the feature prior to depositing a metal layer.

Further, modifying the aluminum metallization process of *Taguchi et al.* by the non-metal polysilicon plug formation process of *Tseng et al.* would render *Taguchi et al.* unsatisfactory for its intended purpose of forming a low oxide titanium layer on the sidewalls of a feature, and thus, destroys the *Taguchi et al.* reference. See, *In re Gordon*, 733 F.2d 900, 902, 221 USPQ 1125, 1127 (Fed. Cir. 1984).

Therefore, the combination of *Taguchi et al.* and *Tseng et al.* does not teach, show, or suggest forming a feature through a first barrier layer formed on a dielectric layer and through the dielectric layer, depositing a second barrier layer on the bottom and sidewalls of the feature, and removing the second barrier layer formed at the bottom of the feature prior to depositing a metal layer. Reversal of the rejection of claims 15-18 and 23 is respectfully requested.

II. THE EXAMINER ERRED IN REJECTING CLAIM 21 UNDER 35 U.S.C. § 103(a) BECAUSE THE CITED REFERENCES DO NOT TEACH, SHOW, OR SUGGEST DEPOSITING A BARRIER LAYER THAT IS REMOVED TO EXPOSE AN UNDERLAYER WITHIN A FEATURE, AND SELECTIVELY DEPOSITING A METAL LAYER ON THE UNDERLAYER TO FILL THE FEATURE, WHEREIN THE METAL LAYER COMPRISES COPPER.

Claim 21 stands rejected under 35 U.S.C. §103(a) as being unpatentable over *Taguchi et al.* in view of *Tseng et al.*, and further in view of *Ho et al.* on grounds that the combination of references shows each feature of the claimed invention. Applicants respectfully traverse this rejection on grounds that the claims include the novel combination of depositing a barrier layer that is removed to expose an underlayer within a feature, and selectively depositing a copper layer on the underlayer to fill the feature.

Taguchi et al. discloses a process to improve an aluminum metallization process and *Tseng et al.* teaches an improved technique to form polysilicon contact plugs for active silicon device elements. As argued above for claims 15-18 and 23, *Taguchi et al.* could not be modified by *Tseng et al.* to teach, show, or suggest the claimed invention without rendering *Taguchi et al.* unsatisfactory for its intended purpose of forming a low oxide titanium layer on the sidewalls of a feature.

Ho et al. discloses the deposition of a conformal barrier seed layer over the bottom and sidewalls of an interconnect and then the deposition of a conductive material on the conformal barrier seed layer to fill the interconnect. *Ho et al.* does not teach, show, or suggest forming a feature through a barrier layer formed on a dielectric layer and through the dielectric layer to expose an underlayer, depositing a second barrier layer on the bottom and sidewalls in the feature, and removing a second barrier layer formed on the bottom of the feature. Further, *Ho et al.* does not teach, show, or suggest selectively depositing a metal layer on the underlayer exposed in the feature.

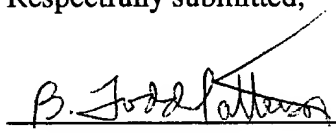
There is no suggestion or motivation in *Taguchi et al.* to modify the two barrier layer process for forming an improved titanium wetting surface for aluminum with the single barrier layer and copper deposition technique of *Ho et al.* to fill a feature in a dielectric layer as recited in claim 15 and claims dependent therefrom. Additionally, there is no suggestion or motivation in the *Tseng et al.* metal free polysilicon plug formation process to use the copper and tantalum metallization process of *Ho et al.* since such a modification of *Tseng et al.* would render *Tseng et al.* unsatisfactory for its intended purpose and destroy the reference.

Thus, the Examiner fails to identify any suggestion or motivation in *Taguchi et al. Ho et al.*, or *Tseng et al.*, alone or in combination, to suggest or motivate the claimed invention. The combination of references must be based on more than identifying each element of an invention in one of the references. Therefore, *Taguchi et al.*, *Ho et al.*, and *Tseng et al.*, neither alone nor in combination, teach, show, or suggest the claimed invention. Reversal of the rejection of claim 21 is respectfully requested.

Conclusion

In conclusion, the references do not teach, show, or suggest forming a feature through a first barrier layer formed on a dielectric layer and through the dielectric layer, depositing a second barrier layer on the bottom and sidewalls of the feature, and removing the second barrier layer formed at the bottom of the feature prior to depositing a metal layer. Thus, Applicants respectfully request withdrawal of the rejection of claims 1-8, 11-18, and 20-21.

Respectfully submitted,



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APPENDIX

15. A method of filling a feature in a dielectric layer, comprising:

a) depositing a first barrier layer over a blanket dielectric layer;

b) forming a feature through the barrier layer and the dielectric layer to expose an underlayer;

c) depositing a second barrier layer on a bottom and sidewalls in the feature;

d) removing the second barrier layer formed at the bottom of the feature; and

e) selectively depositing a metal layer on the underlayer exposed in the feature.

16. The method of claim 15, wherein the first barrier layer and the second barrier layer are comprised of Si_xN_y.

17. The method of claim 16, wherein the first barrier layer and the second barrier layer are formed using chemical vapor deposition techniques.

18. The method of claim 17, wherein the second barrier layer is removed from the bottom of the feature by sputter etching techniques.

21. The method of claim 15, wherein the metal layer comprises copper.

23. The method of claim 15, wherein the metal layer is deposited using electroplating techniques.

Related Appeals and Interferences

Appellant asserts that no other appeals or interferences are known to the appellant, the appellant's legal representative, or assignee which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

Status of Claims

Claims 15-18, 21, and 23 are pending in the application. Claims 1-20 were originally presented in the application. Claims 21-24 were added during prosecution, and claims 1-14, 19-20, 22, and 24 were canceled without prejudice by the Applicants during prosecution. Claim 19 was restricted and canceled without prejudice by Applicants during prosecution. Claims 15-18, 21, and 23 stand rejected in view of a combination of references as discussed below. The rejection of claims 15-18, 21, and 23 is appealed. The pending claims are shown in the attached Appendix. No claims have been allowed.

Status of Amendments

The claims in the Appendix include all amendments entered by the Examiner prior to filling of this Appeal Brief.

Summary of the Invention

The claimed invention generally provides a method for filling a feature with copper. In one embodiment, the method comprises first forming a reliable barrier layer in the feature to prevent diffusion of the copper into the dielectric layer through which the feature is formed. The method for filling a feature formed in a dielectric comprises forming a generally conformal first barrier layer 16 over a patterned dielectric 12, removing the portion of the first barrier layer 16 formed on the bottom 22 of the feature 20, depositing a second barrier 24 comprising a material selected from a group consisting of Ta, TaN, TaSiN, TiSiN, and combinations thereof, and then filling the feature 20 with copper. (*See* page 6, lines 5-22; *see also* Example 1, page 12, line 22, to page 13, line 7, and Figures 2-6) In another embodiment, the method comprises depositing a first

barrier layer 16 over a blanket dielectric layer 12, forming a feature 20 through both the barrier layer 16 and the dielectric layer 12, depositing a second barrier layer 30 in the feature 20, removing the barrier layer 30 from the bottom of the feature 20, and selectively depositing a metal layer in the feature 20. (*See* page 6, line 23, to page 7, line 11; *see also* Example 2, page 13, lines 8-16, and Figures 7-12).

Issues Presented

1. Whether the Examiner erred in rejecting claims 15-18 and 23 under 35 U.S.C. § 103(a) as being unpatentable over *Taguchi et al.* in view of *Tseng et al.*

2. Whether the Examiner erred in rejecting claim 21 under 35 U.S.C. § 103(a) as being unpatentable over *Taguchi et al.* in view of *Tseng et al.*, and further in view of *Ho et al.*

Grouping of Claims

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ARGUMENT

I. THE EXAMINER ERRED IN REJECTING CLAIMS 15-18 AND 23 UNDER 35 U.S.C. § 103(a) BECAUSE THE CITED REFERENCES DO NOT TEACH, SHOW, OR SUGGEST DEPOSITING A BARRIER LAYER THAT IS REMOVED TO EXPOSE AN UNDERLAYER WITHIN A FEATURE, AND SELECTIVELY DEPOSITING A METAL LAYER ON THE UNDERLAYER TO FILL THE FEATURE.

Claims 15-18 and 23 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Taguchi et al.* in view of *Tseng et al.*, on grounds that the combination of references shows each feature of the claimed invention. Applicants respectfully traverse this rejection on grounds that the claims include the novel combination of depositing a barrier layer that is removed to expose an

underlayer within a feature, and selectively depositing a metal layer on the underlayer to fill the feature as described in the specification and Figures 7-11.

To determine patentability under 35 U.S.C. § 103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved, and the obviousness or non-obviousness of the subject matter is determined against this background. *Graham v. John Deere*, 383 U.S. 1 (1966). Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). To establish prima facie obviousness of a claimed invention, all the claimed limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974).

Taguchi et al. discloses deposition of a first barrier layer on the sidewalls of a hole in order to reduce oxidation of a second barrier layer of titanium and provide an improved wetting surface for aluminum fill of a hole. *Taguchi et al.* further discloses conformal deposition of the second barrier layer on the bottom and sidewalls of the feature and requires the formation of two barrier layers on the sidewalls of a hole before filling the feature with metal. The conformal barrier layer of *Taguchi et al.* is not removed to expose an underlayer, but rather retained in a conformal state to ensure conformal fill of the feature by aluminum.

Taguchi et al. does not teach, show, or suggest forming a feature through a first barrier layer formed on a dielectric layer and through the dielectric layer. *Taguchi et al.* does not teach, show, or suggest depositing a second barrier layer on the bottom and sidewalls of the feature and removing the second barrier layer formed at the bottom of the feature prior to depositing a metal layer.

Tseng et al. discloses the formation of a polysilicon plug by depositing a first barrier layer over a blanket dielectric layer, forming a feature through a barrier layer and the dielectric layer to

expose an underlayer, depositing a polysilicon fill layer in the feature, and removing the barrier layer from the surface of the blanket dielectric layer prior to deposition of a metal layer.

Tseng et al. does not teach, show, or suggest depositing a second barrier layer on the bottom and sidewalls of the feature. *Tseng et al.* does not teach, show, or suggest removing the second barrier layer formed at the bottom of the feature prior to depositing a metal layer. Further, *Tseng et al.* does not teach, show, or suggest selectively depositing a metal layer on the underlayer exposed in the feature. Therefore, neither *Taguchi et al.* or *Tseng et al.*, alone or in combination, teach, show, or suggest depositing a barrier layer that is removed to expose an underlayer within a feature, and selectively depositing a metal layer on the underlayer to fill the feature.

Applicants further submit that the Examiner has erroneously combined the elements of *Taguchi et al.* and *Tseng et al.* without a proper motivation or suggestion to combine the references. The Examiner has identified some elements of the claims in abstract by the use of individual references to teach individual elements, and has not identified a suggestion or motivation for combining the elements to teach the invention. A rejection cannot be predicated on mere identification of individual components of the claimed invention; but rather particular findings must be made as to the reason the skilled artisan, with no knowledge of the claimed invention, would have selected these components for combination in the matter claimed. *See, In re Kotzab,* 55 USPQ2d 1313, 1317 (Fed. Cir. 2000).

Taguchi et al. discloses a process to improve an aluminum metallization process, and *Tseng et al.* teaches an improved technique to form polysilicon contact plugs for active silicon device elements. The metal free polysilicon plug formation process of *Tseng et al.* does not address the same or similar problems in the art as disclosed in the aluminum metallization process of *Taguchi et al.* and, therefore, it would not have been obvious to modify *Tseng et al.* by *Taguchi et al.* to produce the claimed invention. Accordingly, there is no suggestion or motivation in *Taguchi et al.* or *Tseng et al.*, either alone or in combination, to form a feature through a first barrier layer formed on a dielectric layer and through the dielectric layer, deposit a second barrier layer on the bottom and sidewalls of the feature, and remove the second barrier layer formed at the bottom of the feature prior to depositing a metal layer.

Further, modifying the aluminum metallization process of *Taguchi et al.* by the non-metal polysilicon plug formation process of *Tseng et al.* would render *Taguchi et al.* unsatisfactory for its intended purpose of forming a low oxide titanium layer on the sidewalls of a feature, and thus, destroys the *Taguchi et al.* reference. See, *In re Gordon*, 733 F.2d 900, 902, 221 USPQ 1125, 1127 (Fed. Cir. 1984).

Therefore, the combination of *Taguchi et al.* and *Tseng et al.* does not teach, show, or suggest forming a feature through a first barrier layer formed on a dielectric layer and through the dielectric layer, depositing a second barrier layer on the bottom and sidewalls of the feature, and removing the second barrier layer formed at the bottom of the feature prior to depositing a metal layer. Reversal of the rejection of claims 15-18 and 23 is respectfully requested.

II. THE EXAMINER ERRED IN REJECTING CLAIM 21 UNDER 35 U.S.C. § 103(a) BECAUSE THE CITED REFERENCES DO NOT TEACH, SHOW, OR SUGGEST DEPOSITING A BARRIER LAYER THAT IS REMOVED TO EXPOSE AN UNDERLAYER WITHIN A FEATURE, AND SELECTIVELY DEPOSITING A METAL LAYER ON THE UNDERLAYER TO FILL THE FEATURE, WHEREIN THE METAL LAYER COMPRISES COPPER.

Claim 21 stands rejected under 35 U.S.C. §103(a) as being unpatentable over *Taguchi et al.* in view of *Tseng et al.*, and further in view of *Ho et al.* on grounds that the combination of references shows each feature of the claimed invention. Applicants respectfully traverse this rejection on grounds that the claims include the novel combination of depositing a barrier layer that is removed to expose an underlayer within a feature, and selectively depositing a copper layer on the underlayer to fill the feature.

Taguchi et al. discloses a process to improve an aluminum metallization process and *Tseng et al.* teaches an improved technique to form polysilicon contact plugs for active silicon device elements. As argued above for claims 15-18 and 23, *Taguchi et al.* could not be modified by *Tseng et al.* to teach, show, or suggest the claimed invention without rendering *Taguchi et al.* unsatisfactory for its intended purpose of forming a low oxide titanium layer on the sidewalls of a feature.

Ho et al. discloses the deposition of a conformal barrier seed layer over the bottom and sidewalls of an interconnect and then the deposition of a conductive material on the conformal barrier seed layer to fill the interconnect. *Ho et al.* does not teach, show, or suggest forming a feature through a barrier layer formed on a dielectric layer and through the dielectric layer to expose an underlayer, depositing a second barrier layer on the bottom and sidewalls in the feature, and removing a second barrier layer formed on the bottom of the feature. Further, *Ho et al.* does not teach, show, or suggest selectively depositing a metal layer on the underlayer exposed in the feature.

There is no suggestion or motivation in *Taguchi et al.* to modify the two barrier layer process for forming an improved titanium wetting surface for aluminum with the single barrier layer and copper deposition technique of *Ho et al.* to fill a feature in a dielectric layer as recited in claim 15 and claims dependent therefrom. Additionally, there is no suggestion or motivation in the *Tseng et al.* metal free polysilicon plug formation process to use the copper and tantalum metallization process of *Ho et al.* since such a modification of *Tseng et al.* would render *Tseng et al.* unsatisfactory for its intended purpose and destroy the reference.

Thus, the Examiner fails to identify any suggestion or motivation in *Taguchi et al. Ho et al.*, or *Tseng et al.*, alone or in combination, to suggest or motivate the claimed invention. The combination of references must be based on more than identifying each element of an invention in one of the references. Therefore, *Taguchi et al.*, *Ho et al.*, and *Tseng et al.*, neither alone nor in combination, teach, show, or suggest the claimed invention. Reversal of the rejection of claim 21 is respectfully requested.

APPENDIX

15. A method of filling a feature in a dielectric layer, comprising:

a) depositing a first barrier layer over a blanket dielectric layer;

b) forming a feature through the barrier layer and the dielectric layer to expose an underlayer;

c) depositing a second barrier layer on a bottom and sidewalls in the feature;

d) removing the second barrier layer formed at the bottom of the feature; and

e) selectively depositing a metal layer on the underlayer exposed in the feature.

16. The method of claim 15, wherein the first barrier layer and the second barrier layer are comprised of Si_xN_y.

17. The method of claim 16, wherein the first barrier layer and the second barrier layer are formed using chemical vapor deposition techniques.

18. The method of claim 17, wherein the second barrier layer is removed from the bottom of the feature by sputter etching techniques.

21. The method of claim 15, wherein the metal layer comprises copper.

23. The method of claim 15, wherein the metal layer is deposited using electroplating techniques.